

Summary of modern physics review meeting held on November 12, 2004

Present: Tim Wilson, Physics; Alan Cheville, ECEN; Jerzy Krasinski, ECEN; Jim West, ECEN; Fisher Zhang, ECEN; Weili Zhang, ECEN.

It has been approximately two years since the ECEN department proposed change to the modern physics course that is required for all like to go engineering students, nominally in the sophomore year. Before the changes, this course was a review of modern physics covering quantum mechanics, relativity, molecular structure and bonding, and a variety of other topics summarizing physics for the last 100 years. Working with faculty in the physics department, ECEN changed the course to be an introduction to semiconductor device physics.

The overall impression of Tim Wilson is that the course is significantly better than it was before the changes were made. This impression is based on the fact that students are more motivated, the instructor receives good feedback from students who have taken the course previously, and that grades overall have improved. Tim perceives that one of the weaknesses in this course is that it is difficult to tell engineers why this material is important for their careers, and that emphasizing "why" would improve the course. Tim Wilson and Alan Cheville have applied for National Science Foundation funding to enable these changes to be made.

Those present discussed whether moving modern physics later in the curriculum would help improve student learning. The conclusion was this would not make a big difference. The students seem to have sufficient mathematical background required for the course, primarily differential equations. However students are weak in an understanding of linear algebra. There were some questions by the electrical engineering faculty as to whether quantum mechanics was being over-emphasized in the course, after some discussion the general agreement was the coverage of quantum mechanics is about right for this course and the level of the students.

There are several areas in which the students could be better prepared for the modern physics course, particularly understanding of electromagnetic waves and optics. This is supposed to be covered in the second introductory physics course, but it is not taught well or in sufficient depth. We discussed having modern physics after the electrical engineering electromagnetic fields course, but this was found not to be practical. It was also suggested that modern physics become a prerequisite for the course ECEN 3313 so that students have a better understanding of device physics before they learned about using devices in circuits. Another suggestion that was made was to change the ECEN flowchart so that the devices course (ECEN3913) immediately follows modern physics on the flowchart. This was supported by all faculty and seems to be the easiest and most effective change to make.

Overall the faculty were not supportive of having the electrical engineering devices course be an elective. The overall feeling was that Semiconductor Device Physics does not sufficiently prepare students with knowledge of electronic devices, but it is doing an extremely good job of preparing them with a background in semiconductor device physics. However, faculty were amenable to the idea that individual areas of specialization could choose whether the electrical engineering devices course be required for their students. It was also suggest that the number of the devices course be changed to 4000 level rather than 3000 level so that graduate students could take it.

Summary: changes are extremely positive, course should not change in any substantial manner barring receiving outside funding, changes should be made to ECEN flowcharts and prerequisites.